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The AIM Mail System at the CIA

Automating the Bureaucracy

**Central Intelligence Agency
Office of Data Processing**

**02/23/83
AM-00**

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Disclaimer

My remarks do not necessarily reflect official positions of the Central Intelligence Agency or the United States Government.

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This presentation is not

A pitch for office automation

A tutorial in how to do it yourself

A comparison of electronic mail systems

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What I will describe

The way we did it

What our system does today

Pitfalls

Suggestions based upon our experiences

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The Intelligence Business

Essentially an information factory

- information arrives, usually in electronic form
- information is refined
- finished product is distributed to our customers

Computers are analagous to the assembly line

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Computing Environment

General Timesharing Service

- two loosely-coupled VM/CMS systems
- over 5000 users

Other timesharing services

Interfaces to external telecommunications systems

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Objectives

Simple and easy to use by "real people"

High performance

Extensible

Capable of handling official correspondence

Full support for smart glass teletypes

Secure

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Implementation Approach

Central database virtuals

User virtuals for document creation, editing, display
and management

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PROC System

Facility to support development of complex, assembly language system facilities

Macro and text libraries

- structured macros
- stack oriented
- multitasking
- interprocess communication (VMCF)

Available through Waterloo library

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Folders

Identifier - name

Standard user folders

- INBOX incoming mail
- WORK work in process
- OUTBOX outgoing mail

User defined folders

Lettered "folders" - accessed minidisks

System folders

Folder sharing - GET, PUT and ALL accesses

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Documents

Identifiers

- category (MEMO, LETTER, etc)
- name
- ordinal reference

Routing

- FROM originator other than creator
- THRU individuals whose concurrence is required
 in sequence before document is released
- TO recipients of "action" copies
- CC recipients of "information" copies

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Documents

Attributes set by user

- subject
- routing
- classification
- codewords
- user defined keywords
- EYES ONLY
- password

Attributes set by system

- sent / not sent
- seen / not seen
- various file system data elements, such as the date the document was created, the number of records, etc.

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Frequently Used Commands

| | |
|---------|---|
| LIST | list documents or folders |
| DISPLAY | view a document |
| PRINT | print a document on an OS/6 |
| EDIT | create or alter a document using a local editor - limited support for XEDIT |
| SEND | send a new document - create a new document using the model facility if necessary |
| REPLY | create a document in response to another |
| FORWARD | route a document to the next addressee(s) |
| QUERY | display the status of documents and the system |
| ERASE | get rid of this copy of a document |
| MOVE | copy a document from one folder to another |

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Page Denied

Next 7 Page(s) In Document Denied

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Other System Commands

| | |
|-----------|---|
| CREATE | create a new document or folder |
| COPY | copy documents from one folder to another |
| DUPLICATE | create a duplicate copy of a document in another folder |
| USE | logically group folders |
| MONITOR | request notification when events occur |
| ACCESS | designate search sequences for system folders |
| OPEN | explicitly open a folder |
| CLOSE | explicitly close a folder |
| FOLDER | designate who may access a folder |
| HELP | display online documentation |

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Simplicity vs. Flexibility

Models

- EXEC-like templates

Aliases

- nicknames

System folders

System Administrators

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Data Integrity

File structure

Database backup

SEND recovery

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Database

Initial approach

- CMS file system
- utterly breaks down with 20,000+ files/minidisk

Current technique

- block I/O
- CMS minidisks (formatted 1K) with all space reserved

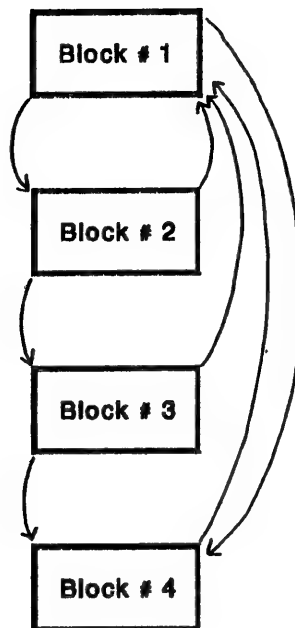
| disk # | block # |
|--------|---------|
|--------|---------|

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File Structure

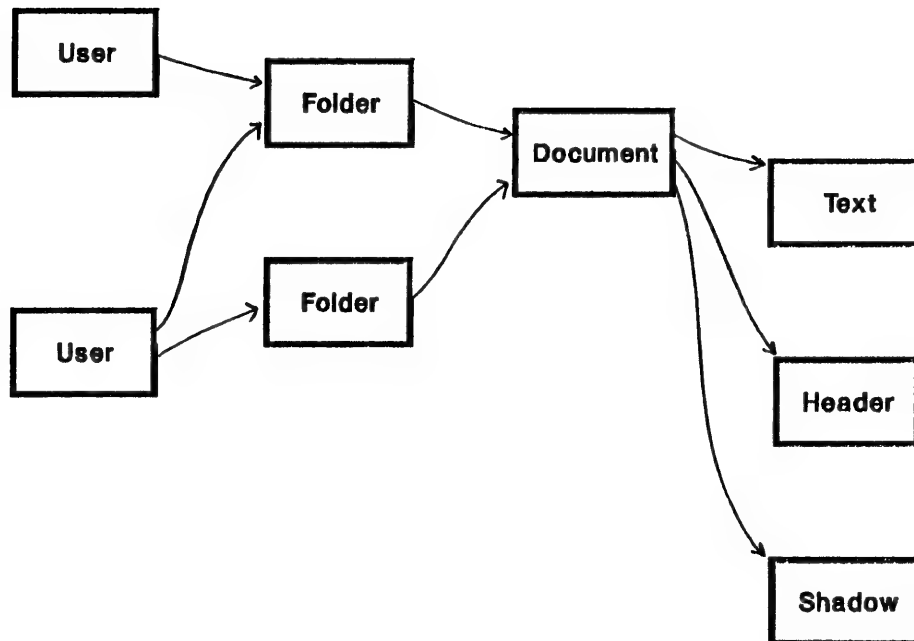


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Database Structure

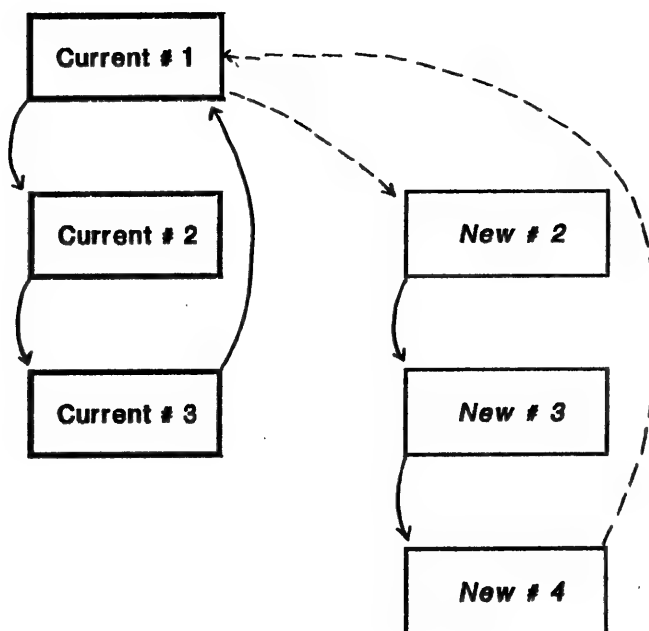


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File Integrity



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File Handler

Requests

- GET / PUT
- file identifier (disk and block numbers)

Returns

- data to local queue
- data to user queue (blocked 4K)

Less than 5% of calls are writes

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Backup

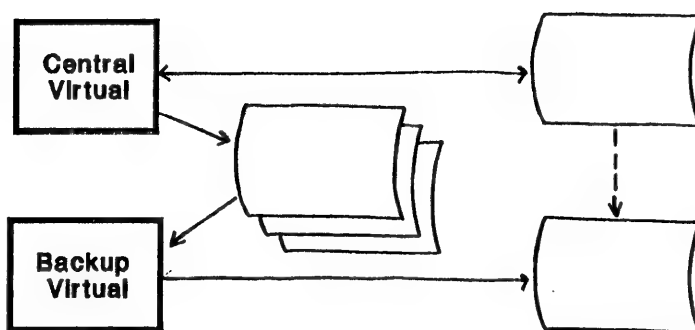
Transaction for complete data recovery

Dual database for quick recovery

Only database writes logged

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Backup Structure



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Database Virtual Task Structure

| | |
|-------|------------------------|
| OPEN | get a folder directory |
| GET | read a document |
| PUT | file a document |
| Other | commands |

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User Virtual Task Structure

Main task process all commands

File handler GET / PUT files

IMACOM update directory

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Interpreter

Variables

- simple: single line
- complex: multiple-line

Keywords recognized by system

Commands to interpreter

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Interpreter Variables and Commands

| | | | |
|---------|---------|---------|---------|
| SYSUSER | SYSCMD | SYSNAME | SYSDOC |
| SYSDATE | SYSMNTH | SYSNDAY | SYSYEAR |
| SYSNDAT | SYSDAY | SYSTIME | SYSTI24 |
| SYSDATI | SYSJUL | SYSDAT2 | SYSCLAS |
| SYSREV | SYSOD | SYSOU | SYSSD |
| SYSST | SYSSU | SYSEEND | SYSEENU |
| SYSCHND | SYSCHNU | SUBJECT | TEMP |
| TEMP001 | TEMP002 | TEMP003 | CLASS |
| POSTAL | REJECT | REPLYTO | REPLYCC |
| REPLYTH | REF | KEYWORD | CODEWRD |
| PROMPT | RETCODE | SYSNUM | SYSEVAL |
| SYSFOLD | SYSF1 | SYSF2 | SYSLINE |
| SYSLEN | SYSHTXT | SYSCASE | SYSWHO |
| SYSALI | RESET | SYSSTRG | SYSPARS |
| TO | CC | THRU | FROM |
| CORD | BCC | AS | AT |
| PRIV | LEVEL | RETAIN | PRTY |
| RECEIPT | READ | CALL | SYSFILE |
| CAMREAD | TYPE | MTYPE | STACK |
| AUDIT | SEDT | COPY | QUIT |
| CONTROL | COMMENT | ALIAS | |
| IF | ELSE | ENDIF | ENDDO |
| DO | DOEXIT | DONEXT | ENDCASE |
| CASENTR | CASE | CASELSE | ENDPROC |
| TEXT | ENDTEXT | PROC | |
| INPUT | INSERT | EXIT | QUIT |

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Typical Model

```
&if &syscmd eq FILE or &syscmd eq SAVE
&subject='Note Model:'
  &exit
&endif
&type
&call a$class
&&class = &sysclas,&syshtxt(&class)
&type
&call b$adre to text nomulti prompt error verify default
&type
&call a$subject
&&subject = &syshtxt(&subject)
&&tempsub= '&&subject'
&&if &&syscmd eq DISPLAY
  &&type '&&sysndat from: &&sysname subject: &&tempsub '
&&endif
&stack user1
&if &sysnum(&class) gt 0
.nf
.he "&class"
.fe "&class"
&endif
DATE: &sysdate

NOTE TO: &to

SUBJECT: &subject
.nf

&mtype ' ' 'Enter Text, or ?'
&input
&mtype ' ' 'DOCUMENT ACCEPTED. PLEASE WAIT ...'
```

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System Directory

Userid

Name

Telephone number

System

Privileges

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System Control Commands

| | |
|-----------|---|
| USER | display current and maximum number of users |
| INFO | display system performance statistics |
| DIRECTORY | update system directory |
| SHUTDOWN | terminate the system |

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Performance

Bottlenecks

- paging
- I/O
- processor

VMCF not a culprit

Users

- as many as 30 concurrently
- about 300 unique users daily
- over 1,000 in directory

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Performance Statistics

AIMSYS INFO Command*

CNTRL101 HAS BEEN UP FOR 0 DAYS, 13 HOURS, 57 MINUTES, 7 SECONDS
--≥ 4% ACTIVE 11% VMCF WAIT 63% I/O WAIT
--≥ 1020 OPENS, 630 (62%) DEFERRED
--≥ 82571 READS, 63127 (76%) FROM DISK 8055 WRITES, 7334 (91%) TO DISK
--≥ 20% STORAGE UTILIZATION 10 MAX USERS
--≥ 65982 LOCKS REQUESTED, 253 (0%) WAITED

(*) figures were collected on the day of the blizzard

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User Acceptance

Used by management

User documentation

User training

User demands

New services

Improved performance

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Development Effort

Scope of effort

- concept in 1978
- development begun in 1979 as a back-burner project
- full-scale development in 1980
- restricted version available for testing in 1981
- production in 1982

Software

- 580 modules, 88K lines of code in user virtual
- 185 modules, 43K lines of code in central virtual

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Dependencies

Control Program

- three local diagnoses (optional)

Conversational Monitor System

- block I/O
- enhanced abend recovery (optional)

Waterloo Script

Local editor

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Electronic Mail vs. Word Processing

Many users find command-based, interactive systems unfriendly and frightening

Our customers are willing to put a computer terminal or a word processor on each desk, but not both

Connectivity and secure sharing of data is a problem with most word processing systems

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Host-based Word Processor

Exploits the intelligence in our standard terminal to provide integrated word processing functions to the timesharing system user

An application program that runs under CMS

Provides a "what you see is what you get editor"

Uses Waterloo Script in a transparent manner to format text

Will be integrated with AIM soon

Looks, feels and tastes like a "typical" word processor

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Other Advanced Applications

Trend is toward complex applications that manage the screen while interfacing to back-end database systems

Front-end (user virtual) portions of AIM must co-exist in same virtual machine with applications code

Special monitor to allow limited multitasking

PL/I interface

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Future

Import / Export

Multiple central database virtuals

Multiple VM systems

Spelling checkers

Calendars, schedules, reminders

Event support, timers

Archiving

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